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(54) Composite Material of Precious Metals

(57) A composite material for use in the manufacture of jewellery includes a core (11) of silver or silver alloy encased in a shell (10) of gold or gold alloy having a thickness of at least 0.003 inch (0.076 mm) so that the material can be worked in a manner comparable to that of solid gold. A similar material may comprise platinum on a silver core or platinum on a gold core. A block of material may be reduced by drawing to form composite wire.

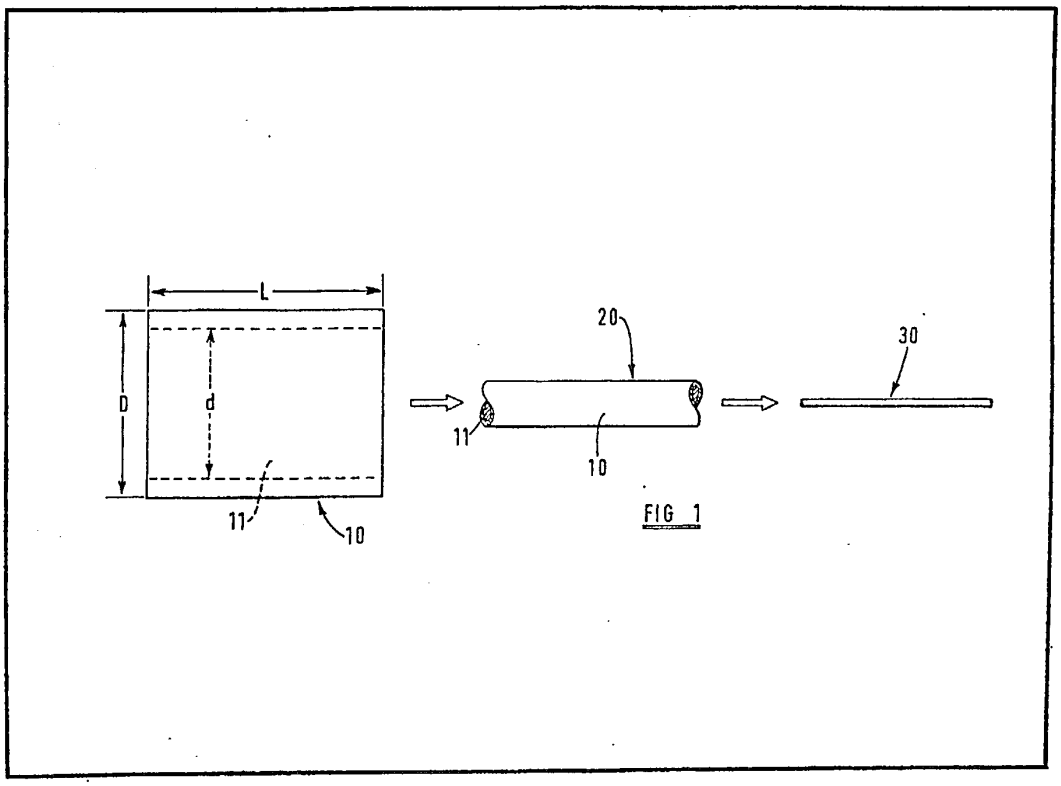

FIG 1

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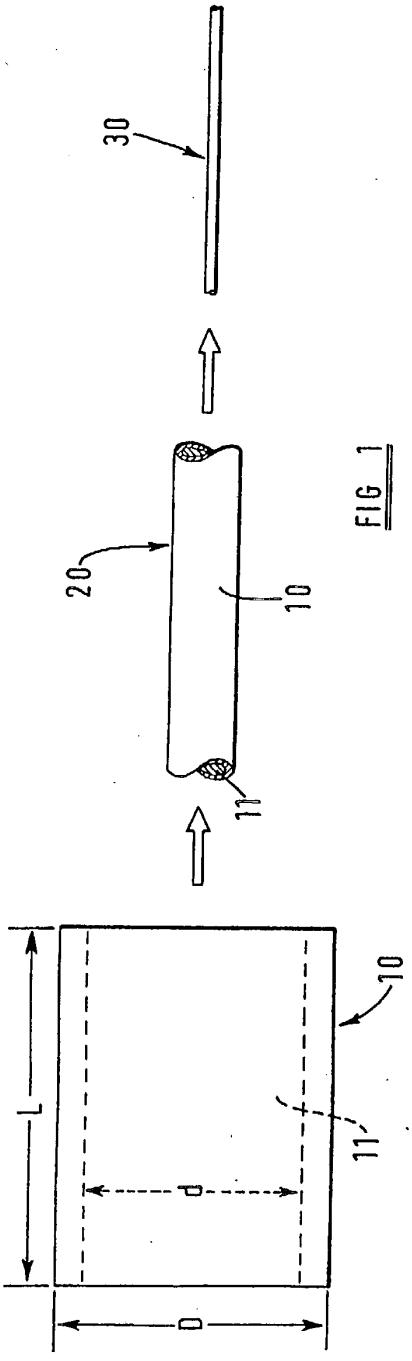

FIG 1

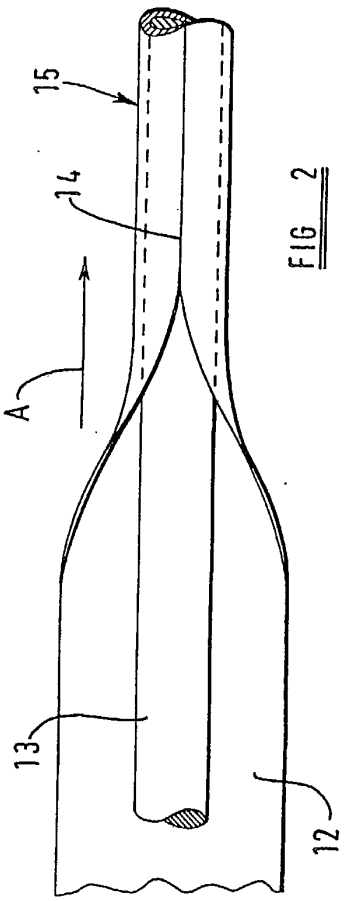

FIG 2

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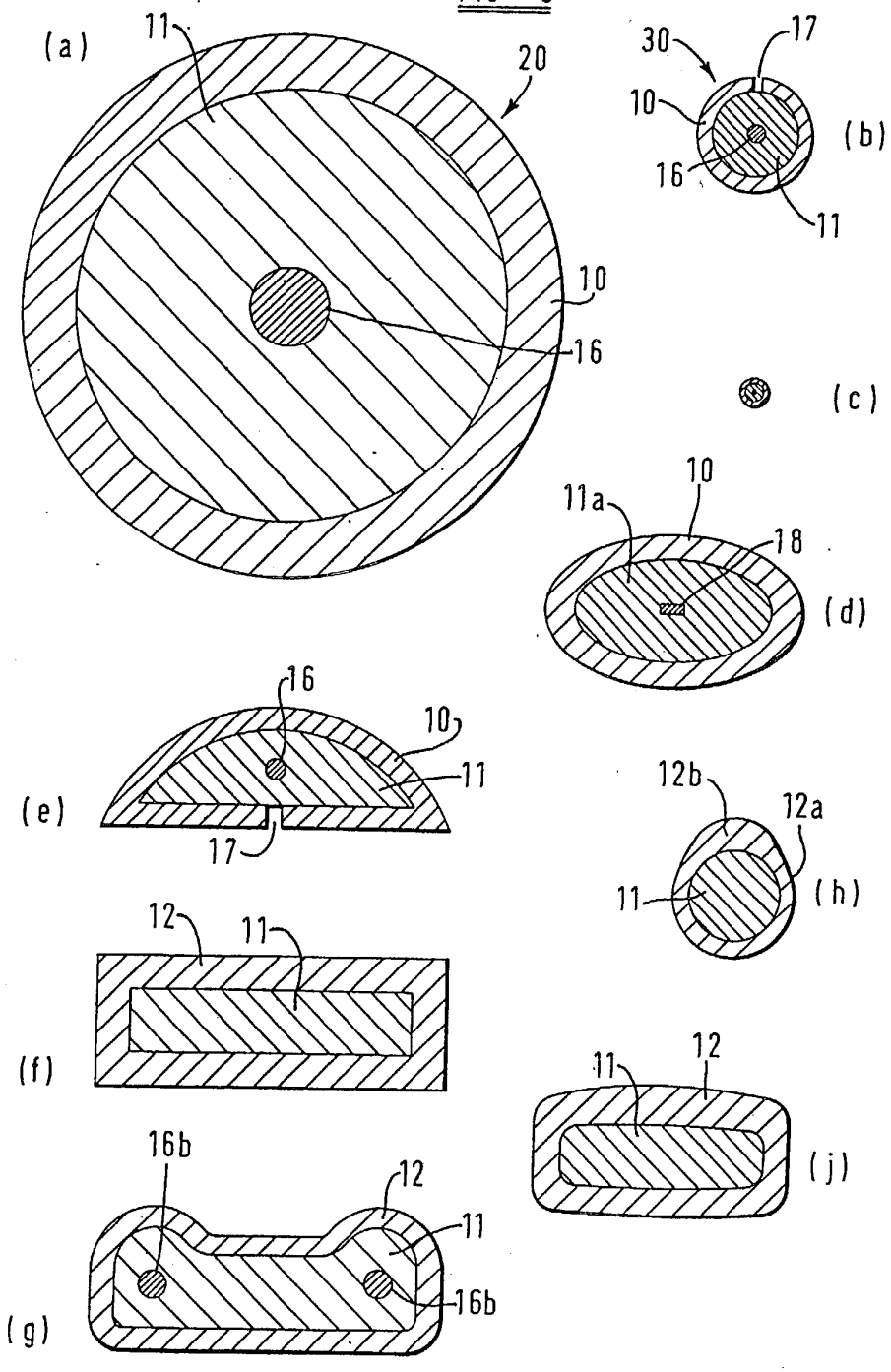
FIG 3



SPECIFICATION

Articles of Precious Metal

This invention relates to the manufacture of articles in precious metals, primarily gold and silver. In this trade, there have been increasing problems because of the rapid rise in the cost of the raw materials to such an extent that there is a rapidly falling market demand for solid gold articles, except at the very expensive "investment" end of the market.

In addition to its value and durability, gold (which term includes the commercially available alloys of gold ranging from 9 ct. upwards) has the special advantage that it is ductile and can be extruded, drawn, rolled, stamped, shaped, cut and engraved readily to produce a wide range of articles of jewellery.

However, because of the high cost of gold, there has been a substantial market for relatively inexpensive articles which have the external appearance of being made from gold by utilising the techniques of gold plating or that known as "rolled gold". However, articles made in this way are very poor in terms of endurance when compared with the solid gold equivalent because the layer of gold is so very thin. Typically, the thickness of the gold layer is between 10 and 75 microns in the case of rolled gold and substantially less for plated gold, so that it can be worn away in a relatively short time, particularly in such articles as rings where the inside of the band may take much heavy wear, so that in a comparatively short time the gold coating may be partially worn away so as to reveal the underlying metal, whereas no comparable problem can be expected with an article made of solid gold.

Moreover, the intrinsic values of such articles is very low because the gold in such cases is usually overlaid on a base metal. Even if the gold is overlayed onto silver, the durability of the gold layer conventionally employed in such known techniques is quite limited.

The extent to which conventional rolled gold can be worked in the production of jewellery is very limited because of the thinness of the gold layer, which is relatively easily displaced to reveal the underlying base metal. For this reason, rolled gold stock has to be available in a wide range of sizes and shapes so that such stock can be fabricated into finished articles of varying types, ranging for example from links for chains, through finger rings, to such items as bracelets. In each case, the stock material must be chosen so as to correspond quite closely to the sectional shape and size of the finished item, otherwise there is a very substantial risk of damage to the gold coating.

The object of the invention is to provide a novel material for use in making articles having an exterior of gold, and which can be worked in substantially the same way as gold itself to produce an article with a "life" virtually equivalent to that of a solid gold article.

With this object in view, we provide a composite material comprising a core of silver or a silver alloy which is encased in a shell of gold or a gold alloy, having a thickness of at least three thousandths of an inch (0.076 mm).

This material may be formed as a rod or wire by drawing a block of such composite material through a suitable reducing die, and such rod or wire can then be worked in a manner virtually as if it were of solid gold. All the normal operations employed in working solid gold stock to produce jewellery can be performed on such material without causing separation of the gold and silver components because the underlying silver core is itself sufficiently ductile and workable and the thickness of the gold shell is so chosen that it will not, by any normal process, be displaced sufficiently for the core to be exposed. This is in complete contrast to conventional rolled gold materials where such working is not generally possible.

However, if for special effects, it is desired to remove some small areas of the gold shell to expose the silver core to produce a pattern having contrasting colours, this can readily be done.

Thus, the material can be used by manufacturing jewellers effectively as if it were solid gold, but it is much less expensive than solid gold, and even more versatile so far as patterning is concerned.

Because the material can be so readily worked, it need not be made commercially in such a wide range of sections and sizes as is necessary for rolled gold, and accordingly the manufacturing jeweller need not stock such a large range of different sizes of material.

The silver used for the core need not comply with the current standards of minimum fineness required by the Hallmarking Act, in which case articles produced from the material cannot be Hallmarked or sold as "Silver". However, the silver is preferably of at least minimum fineness so that the article can be Hallmarked as silver.

The material may also be made by using a sheet of gold of appropriate thickness and rolling this onto a preformed silver core, with or without simultaneous or subsequent reduction of the cross-sectional area of the composite produced. In this case, the shell of gold may totally enclose the silver core, or a narrow gap or seam may be left, preferably no wider than the thickness of the shell, through which access to the core is possible for examination for Assay purposes.

In contrast to the production of conventional rolled gold material, it is not necessary to fuse or otherwise bond the core and the shell to one another, but the material in accordance with the invention can be made in the same range of sectional shapes as conventional rolled gold, and indeed in an even wider range of shapes due to the ductility which is possible with the silver core and the thickness of the gold shell.

We have established that if the gold shell has a thickness of at least three thousandths of an inch the material can be subjected to all the normal process used in the manufacture of jewellery

without disruption of the shell. However, greater thicknesses can be employed so that we prefer to utilise a thickness of about five thousandths of an inch (0.127 mm).

The gold shell is preferably of uniform thickness, but may in special cases be of varying thickness so as to provide, for example, a portion which can be embossed to an unusually great extent for a special effect without risking exposure of the core.

If desired, the silver core may itself be provided with an inner core of a suitable solder to facilitate the joining of the ends of lengths of the material to form links or rings. However, such solder inner core is not essential.

The invention further resides in a method of manufacturing an article comprising first making a composite blank having an external shell of gold, or a gold alloy, and a core of silver, or an alloy of silver, filling the interior of the shell, acting upon said composite blank to elongate it in the axial direction to reduce its cross-sectional area to such an extent that the thickness of the gold shell is nowhere less than three thousandths of an inch, and finally using some or all of said elongated blank to fashion the article.

The invention will now be described by way of example with reference to the accompanying drawings wherein:

Figure 1 illustrates diagrammatically one method of forming the composite material in accordance with the invention;

Figure 2 illustrates an alternative method; and

Figure 3 illustrates a range of alternative sectional shapes in which the material may be formed by those methods.

Referring firstly to Figure 1, the composite material in accordance with the invention may be made by commencing with a cylindrical block 10 of gold, typically having a length L of 4" (100 mm) and a diameter D of $2\frac{1}{2}$" (63 mm). The centre is drilled out to provide an internal bore having a diameter *d* typically of 2" (50 mm), and into this bore there is inserted a close fitting block 11 of silver. The composite block thus formed is then subjected to a conventional drawing operation so as to greatly increase its length and reduce its diameter by a factor which may be of the order of fifty times. The drawing operation may be carried out in a number of stages, and in Figure 1 there is shown at 20 a short section of the length of the material after its diameter has been reduced to approximately one half inch (12 mm), and at 30 a further section whose diameter has been reduced to approximately one tenth inch (2.5 mm). With the initial dimensions as previously indicated, the composite material may be drawn down to a diameter of 0.05 (1.27 mm) inches with a corresponding reduction in the thickness of the gold shell to 0.005 inches (0.127 mm).

Further elongation so as to reduce the thickness of the gold shell to not less than 0.003 inches (0.076 mm) is possible, corresponding to a composite wire having an outside diameter of 0.03 inches (0.76 mm).

If still finer wire is required, it would be necessary to reduce the diameter *d* of the silver block 11 and commence the drawing operation with a composite block having a correspondingly increased thickness of gold.

Nevertheless, in the preferred case, as illustrated, the thickness of the gold shell is about one tenth of the diameter (or one fifth of the radius) of the block and the wire drawn therefrom. Nevertheless, this ratio may be varied within wide limits, providing the thickness of the gold shell is not reduced, during drawing, to less than 0.003 inch.

Instead of commencing with a solid cylindrical block of gold, it would alternatively be possible to wrap a slab of gold of the appropriate thickness about a cylindrical block of silver, and then subject this composite block to the drawing operation previously described.

As a development of this process, it is also possible to form similar composite material in a continuous operation as illustrated in Figure 2. In this case, a rod or wire 13 of silver is advanced continuously in the direction of the arrow A together with a continuous strip 12 of gold. By means of suitable rollers (not shown) the gold strip 12 is folded around the silver wire 13 and compressed onto it so that the opposed edges of the strip 12 are brought together to form a longitudinal seam 14. This rolling process may take place without significant reduction in the cross-sectional dimensions of the composite wire 15 which is thus produced. In this way, composite material in accordance with the invention can readily be produced from wire and strip stock, and the composite wire 15 can itself then be drawn, as in Figure 1, to produce thinner wire.

The gold utilised in the production of the composite material preferably comprises any of the commercially available grades from 9 ct. upwards, but lower grades could be employed. Similarly, the silver utilised preferably comprises commercially available grades which meet the requirements of minimum fineness, although this need not necessarily be so. However, where the silver core is of a standard such that it can be Hallmarked, we prefer to make the composite material by the method illustrated in Figure 2 and to leave a narrow gap in the gold shell by so choosing the width of the gold strip 12 that the edges thereof do not quite meet.

The width of such a gap should preferably not exceed the thickness of the gold shell, but such a gap is sufficient to enable access to be had to the silver core for Assay purposes.

Having produced composite stock material in accordance with the invention in the form of a wire having a diameter which may typically be anything between one inch (25 mm) and 0.05 inch (1.27 mm), such material may then be worked by any of the conventional processes employed in the manufacture of jewellery and the like without fear of disrupting the gold shell.

Where the material is to be formed into links,

finger-rings, or bangles, appropriate lengths of the material can readily be bent to bring the ends together, and the two ends may then be soldered. To facilitate this, the material may be formed with an inner core of a suitable solder. This can quite simply be achieved by incorporating a core of solder in the initial block 11 or wire 13.

In addition to forming lengths of the wire stock into links and the like, it is also possible to alter the cross-sectional shape of the material, either during the formation of the wire, or subsequently while lengths of the wire are being made up into jewellery, and Figure 3 illustrates a number of typical cross-sectional shapes and relative sizes in which the composite material according to the invention can be produced or worked.

Thus, there is shown at (a) a transverse section through the wire shown at 20 in Figure 1, but with the addition of an inner core 16 of solder. The section shown at (b) corresponds to that of the material shown at 30 in Figure 1, except that it is made by the process of Figure 2 and includes a narrow gap 17 in the gold shell. The section shown at (c) illustrates a further reduced diameter wire produced by drawing the material shown at (a). Thus, the section shown at (a), (b) and (c) illustrated circular cross-section wires of composite material in accordance with the invention having a diameter of 0.5 inch (12.7 mm), 0.1 inch (2.54 mm) and 0.05 inch (1.27 mm) respectively.

The section shown at (d) may be produced directly by the methods illustrated in Figures 1 and 2 using appropriately shaped and dimensioned starting materials. In this case, the material includes a flat ribbon 18 of solder, and a silver core 11*a* of oval section, overlaid by a correspondingly shaped shell 10 of gold.

However, apart from the ribbon-shaped solder strip 18, material of a similar sectional shape and size could be formed from the material shown at (a) by means of appropriate rolling operations. It is to be noted that it would not be possible to work conventional rolled gold in a similar manner without disturbing the much thinner gold coating and causing it to separate from the core.

The section indicated at (e) is particularly suitable for making finger rings or bracelets and can again be made directly by the method shown in Figures 1 and 2 by utilising suitably shaped and dimensioned starting materials. As illustrated, the material is made by the process illustrated in Figure 2 and the gold shell 10 includes a narrow gap 17 on the face which, in use, would form the inside face of the ring.

The rectangular section material shown at (f), and the specially shaped section shown at (g) can both be made in a similar manner, by either of the processes illustrated in Figures 1 and 2, or by subsequent shaping of material produced to circular section. It will be noted that the section shown at (g) includes two separate cores 16*a* and 16*b* of solder.

In all the previously described examples, the shell 12 of gold is intended to be of uniform thickness, but this is not necessarily the case, and the sections illustrated at (h) and (j) illustrate materials which can be produced having a gold shell of non-uniform thickness. The section illustrated at (h) includes a circular section silver core 11, and a gold shell 12*a* which is of uniform thickness around most of the circumference of the core, but is of increased thickness on one side as indicated at 12*b*. This can be achieved by utilising an appropriately shaped block 10 if the material is made by the method illustrated in Figure 1, or by utilising a strip 12 of gold of appropriately non-uniform thickness if the material is made by the method illustrated in Figure 2.

The section illustrated at (j) can be made in an analogous manner.

It will be understood that where the thickness of the gold shell is nonuniform, the minimum thickness should not fall below the value of 0.003 inch (0.076 mm) so as to ensure that it will not be disrupted when the material is worked to form jewellery. However, the increased thickness of the gold shell at certain positions makes it possible to emboss, engrave, or otherwise recess the material at those positions to a greater depth than would normally be required. In this way, the material can be used to produce special effects including areas in relatively high relief.

As mentioned previously, although it is generally undesirable to cut entirely through the thickness of the gold shell, it is of course possible to do this so as to expose areas of the silver core in order to produce a two-tone pattern.

Whilst the previous examples have been described entirely in terms of a gold shell on a silver core, it will be appreciated that other combinations of precious metals could be employed, and that the invention is not limited solely to the production of a composite material consisting of gold on silver. Thus, also in accordance with the invention, a similar material may be prepared having a platinum shell on a silver core or a platinum shell on a gold core.

Claims

1. A composite material for use in the manufacture of jewellery comprising a core of silver or silver alloy encased in a shell of gold or gold alloy having a thickness of at least 0.003 inch.

2. A material according to Claim 1 which is formed into a rod or wire by drawing a block of such composite material through a suitable reducing die.

3. A material according to Claim 1 formed by wrapping a sheet or strip of gold around the silver core with or without subsequent drawing.

4. A material according to Claim 3 wherein the gold shell affords a longitudinal gap of width no greater than the thickness of the shell adjacent to the gap.

5. A material according to any one of the preceding claims wherein the gold shell is of uniform thickness.

6. A material according to any one of Claims 1

to 4 wherein the gold shell includes a part of relatively increased thickness.

7. A composite material for use in the manufacture of jewellery comprising a core of a first precious metal or alloy thereof encased in a shell of a second precious metal or alloy thereof, having a thickness of at least 0.003 inch.

8. An article of jewellery formed from the material as claimed in any one of the preceding claims.

9. A method of forming a material according to Claim 7 substantially as hereinbefore described with reference to and as shown in Figure 1 of the accompanying drawings.

10. A method of forming a material according to Claim 7 substantially as hereinbefore described with reference to and as shown in Figure 2 of the accompanying drawings.

11. A composite material according to Claim 7 having a cross-sectional shape substantially as hereinbefore described with reference to and as shown in any one of Figures 3*a* to 3*j*.

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